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Local Evaluation Report: I-275 Dynamic Message Sign System

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Local Evaluation Report
I-275 Dynamic Message Sign System

Prepared by

CUTR
Center for Urban Transportation Research
University of South Florida – College of Engineering

November 28, 2001
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The opinions, findings, and recommendations expressed in this report are those of the Center for Urban Transportation Research (CUTR) and the University of South Florida and not necessarily those of the Florida Department of Transportation, Traffic Control Devices (TCD), Inc., or the City of St. Petersburg. This report has been prepared under subagreement to TCD, Inc., FAP No. FL-37-001-R/9812-004-A, Fin. Project ID: 403266-1-52-01 & 403266-1-52-02, Contract No.: 20693, Work Order No.: 9999-021-01, and USF/CUTR Account No. 21-17-455-I.O. This report also fulfills requirements of Partnership Agreement (Section 7) for Technology Deployment Projects-I-275 Dynamic Message Sign System between the Federal Highway Administration and the Florida Department of Transportation. CUTR Principal Investigator has been Michael C. Pietrzyk, ITS Program Director.
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- Michael Feliciano, FDOT District 7 Construction Project Manager
- Major Brian Stickney, City of St. Petersburg Police Department-Special Events
- Angelo Rao, City of St. Petersburg Transportation and Parking Services Department
- William Foster, City of St. Petersburg Signal Maintenance Supervisor
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Executive Summary

In late 1997, an ITS Deployment Demonstration Federal earmark and subsequent ITS High Priority Program grant was awarded to the St. Petersburg area. Under a partnership agreement executed in September 1998 between the Federal Highway Administration and the Florida Department of Transportation, the work plan and operations and maintenance plan was established for the first design-build-maintain ITS deployment project in the Tampa Bay area. Consisting of three dynamic message signs each with a closed circuit television system, and operated from a primary control center (City of St. Petersburg Transportation and Parking Services building) and a secondary control center (City of St. Petersburg Police Department building), the initial stages of a regional freeway and incident management system was placed in operation.

Serving to aid in traffic control and management for Tampa Bay Devil Ray major league baseball games and other downtown St. Petersburg events in the short-term, this project became fully operational on March 1, 2001. Following a 90-day testing ("burn-in") period, the City of St. Petersburg assumed full responsibility for operation and maintenance. According to project partner interviews, a Devil Ray baseball fan perception survey, and a limited "before" and "after" traffic condition inventory, the project is deemed successful. Also, many of the goals and objectives of the partnership agreement, and standard national ITS performance measures have also been addressed. Ultimately, full project benefits can best be determined when the future regional system is in place and there is more challenge to successful system operation. During the course and scope of this evaluation, for instance, the severe traffic congestion that could result from the occurrence of events or incidents was not evident.

Because this project was the first of its kind in the Tampa Bay area, many aspects of ITS design, procurement, deployment, operation, and management have already been learned and are continuing to be experienced. Consequently, the success of this project can be attributed to the development and execution of the unique partnership agreement that established the basis for this and future joint operation and management of ITS.
**Project Description**

An ITS partnership agreement for technology deployment between the Federal Highway Administration and the Florida Department of Transportation was developed in September 1998. This agreement involved the deployment of three Vultron dynamic sign messaging units each with an American Dynamics-SpectraDome closed circuit television system, operated from a primary control center, and a secondary control center. The three Flip Disk/LED signs in Pinellas County (see Project Location map), in proximity of downtown St. Petersburg, Florida (see Project Site map) are located at:

- I-275 southbound, between Exits 14 and 15 (approximately 62nd Avenue North,
- I-275 northbound, between Exits 6 and 7 (approximately 30th Avenue South, and
- I-175 eastbound, west of Exit 1 (approximately 16th Street South)

**Project Location Map**
Each sign has 90 columns of pixels consisting of 18-7X5 modules, and each sign is 10 feet x 20 feet x 4 feet weighing 4,500 pounds. There are a total of 16 downloadable fonts with 256 characters in each font. The DMS may be controlled locally via the onboard controller or remotely via an RS 232 port. The DMS will allow storage of 100 permanent messages and 32 temporary messages. Sixty-four time-based schedules are implementable with 32-day plans at 64 events each day.

The primary control center is located at the existing City of St. Petersburg Transportation and Parking Services building (1744 9th Avenue North). The secondary control center is located at the existing City of St. Petersburg Police Department building (1300 1st Avenue North).
These control center workstations are depicted in the photos that follow. Note that video camera images and/or computer monitor depictions of DMSSs can be seen in each photo.

Primary Control Center

Secondary Control Center
Design and construction of this deployment was the responsibility of the Florida Department of Transportation-District 7 Tampa office. The operations, management, and maintenance responsibility is with the City of St. Petersburg. The ITS project architecture was designed to be consistent with the National ITS Architecture and based on the following:

- An active partnership between FDOT and the local agencies (primarily City of St. Petersburg Transportation and Police Departments),
- Prioritized User Services/Market Packages identified in the FDOT District 7 ITS Strategic Plan (the Freeway Control market package encompasses all of the I-275 DMSS project objectives), and
- Mapping of individual ITS technologies to market packages identifying data flows

Both control centers have the ability to view real-time closed circuit television (CCTV) images and the current dynamic message sign messages. A city-owned fiber optic cable provides the means for the control centers to communicate with each other. The system software is run with PC based hardware in an MS Windows NT platform. All components of the system are standard off-the-shelf hardware and software. The CCTV system is designed to provide a frame rate of up to 15 frames per second over an ISDN TELCO network.

This project was awarded $1 million in Federal funds as a Technology Deployment Demonstration Project, and an additional $750,000 from the TEA-21 High Priority Program. Both awards required and included a state-local match of 20 percent that was met via the federal provision for the use of "toll credits". The original lump sum contract awarded in August 1999 to TCD, Inc. was $1,345,600. Over the course of the project, three work orders totaling $77,800 (including $35,000 for this Local Evaluation Report) were issued. Later, the City of St. Petersburg received another $105,000 to provide the services necessary to maintain the DMS for a year via a maintenance contract. The remaining $221,600 has been used by FDOT for contract administration, construction inspection, and a reserve for any further action to complete the project.

**Purpose of Report**

The purpose of this report is to meet a condition of the partnership agreement between the Federal Highway Administration (FHWA) and the Florida Department of Transportation (FDOT) that a "Local Evaluation Report" be prepared in regard to this technology deployment. The report includes an assessment of how well the project met the goals and objectives of the partnership agreement, and any quantitative results for the applicable "seven standard ITS measures of performance" contained in FHWA guidelines.
Project Goals, Objectives, and Performance Measures

The project partnership agreement between FHWA and FDOT identified three goals, each with separate objectives as follows:

**Goal 1 – Contribute to Making Transportation Facilities More Efficient in the St. Petersburg Area**
- Improved Management of Traffic Along I-275 During Special Event Traffic (Tropicana Field Events) Conditions
- Improved Management of Traffic Along I-275 During Peak Hour Traffic Conditions
- Promote Intermodal Travel (e.g., shuttle buses) to Special Events

**Goal 2 – Integrate System Operations Within the District 7 Region**
- Establish Joint Operation and Management of the I-275 DMSS by the City of St. Petersburg, FDOT, and FHP
- Design I-275 DMSS to be National ITS Architecture Consistent
- Demonstrate the Advantages of Using the National Transportation Communications/ITS Protocol (NTCIP)
- Execute a Set of Memorandum of Agreement (MOA) Between Jurisdictions for Joint Operations, Management, and Maintenance of I-275 DMSS

**Goal 3 – Develop a Cost Effective Operational Solution to the Transportation Challenges on I-275**
- Assure Project Compatibility and Consistency with the Pinellas MPO LRTP and TIP
- Assure Project Compatibility and Consistency with the District 7 ITS Strategic Plan
- Develop an ITS Market Package to Support Deployment of the I-275 DMSS
- Illustrate Expandability of I-275 DMSS and Opportunities for Integration with other District 7 ITS Infrastructure

Additionally, seven standard performance measures, which are linked to the goals of the National ITS Program, have also been identified for assessment and they are:

1. Reduction in Severity and Number of Crashes
2. Reduction in Number of Fatalities
3. Delay Reduction
4. Customer Satisfaction
5. Increased Throughput (goods or people moved per unit time)
6. Cost Reduction
7. Reduction in Fuel Use and Emissions

To the greatest extent possible, the aforementioned project goals and objectives along with the seven standard performance measures will be utilized to determine the success of the I-275 DMSS project deployment.
Timeline of Project Events

In order to provide a documentation of all significant activities (and their respective time durations) that have lead to the development and deployment of this project, the following timeline of events is provided.

- **April 1997** – King Engineering completed a report for the City of St. Petersburg on Variable Message Signs for downtown St. Petersburg (estimated implementation cost of $1 million).

- **November 1997** – Six-month Appropriations Bill for federal transportation funds appropriates an earmark ITS Deployment Demonstration for $1 million.

- **July 1998** – TEA-21 appropriates $750,000 for St. Petersburg Project from the ITS High Priority Program (also, authorization authority given to obligate the funds by September 30, 1998).

- **September 30, 1998** – Partnership Agreement executed between FHWA and FDOT that included a Work Plan and Operations & Maintenance Plan.


- **April 7, 1999** – Design-Build Plans and Proposal completed, and project advertised for June 7, 1999 letting.

- **June 7, 1999** – Operations and Maintenance agreement executed between City of St. Petersburg and FDOT.

- **August 6, 1999** – Design-Build bids are received after extensions are given to contractors to prepare proposals.

- **September 27, 1999** – Contract is executed after review and justification of only one qualified bid.

- **November 5, 1999** – Notice-to-Proceed given to Traffic Control Devices, Inc. (TCD, Inc.), with an anticipated “turn-on” of the system by September 11, 2000.

- **September 28, 2000** – Traffic data collection for “before” traffic conditions is conducted.

- **March 1, 2001** – I-275 DMSS becomes operational for the spring training season of the Tampa Bay Devil Rays baseball team.

- **March 7, 2001** – CUTR receives Notice-to-Proceed to document Local Evaluation Report for I-275 DMSS.

- **March 23, 2001** – Conditional acceptance of the fully operational system is granted by FDOT, and start of 90-day “burn-in” period is commenced.
May 17, 2001 – CUTR conducts first meeting of project partners to discuss project expectations, issues/resolutions, and overall satisfaction.

June 16, 2001 – "Burn-in" completed, and City of St. Petersburg assumes operation and management of the system in accordance with O&M agreement between FDOT and City of St. Petersburg.

June 24, 2001 – CUTR conducts Tampa Bay Devil Rays fan perception survey of I-275 DMSS. Also, traffic data collection of "after" conditions is conducted.

August 16, 2001 – CUTR conducts email follow-up survey of project partners to confirm expectations, issues/resolutions, and overall project satisfaction.

September 12, 2001 – CUTR meets with FDOT District 7 ITS Engineer to review project background and status, and discuss evaluation.

**Primary Project Evaluation Factors**

The evaluation of project performance was primarily conducted in a three-part effort. The first part consisted of a traffic condition survey conducted before and after activation of the I-275 DMSS. The second part involved a fan perception survey at Tropicana Field. The third part included project partner interviews conducted at the beginning and end of the project "burn-in" period. An additional section of this report includes any "other" evaluation issues or project characteristics that could be documented.

**Traffic Condition Survey**

Primary in-bound traffic movements to Tropicana Field parking, and related travel time runs were measured at one period of time "before" activation (September 28-October 1, 2000) of the DMSS, and at one period of time "after" activation (June 21-24, 2001) of the DMSS to determine if any reduction in traffic congestion (or smoother traffic distribution) could be discerned. Both of these periods coincided with baseball events where larger than normal crowds were expected. Traffic condition data was typically recorded for the 1-2 hour period preceding game time. In most cases, comparisons from Tables 1 and 2 do not reveal improvement in quality of traffic flow.

However, it should also be noted that attendance only slightly exceeded the "threshold (25,000) for event congestion" (as determined by City Police Department), and there were no reported incidents during either time of data collection. In other words, an environment of extremely congested traffic conditions due to event demand or incident never occurred during either data collection period. Thus, the ultimate effectiveness of the DMSS under "worst case" conditions could not be determined.
Table 1 – Comparison of Travel Time Runs

<table>
<thead>
<tr>
<th>Period</th>
<th>Attendance</th>
<th>Avg. Travel Time</th>
<th>Avg. Delay</th>
<th>Avg. Running Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Before” (Sunday, October 1, 2000)</td>
<td>28,432</td>
<td>5 minutes-39 seconds</td>
<td>1 minute 32 seconds</td>
<td>32.1 mph</td>
</tr>
<tr>
<td>“After” (Sunday, June 24, 2001)</td>
<td>27,999</td>
<td>6 minutes-2 seconds</td>
<td>1 minute-46 seconds</td>
<td>31 mph</td>
</tr>
</tbody>
</table>

Note: Travel time runs each date were made on the same 2.2 mile route approaching Tropicana Field, and seven runs were averaged for the values indicated for each date.

Table 2 – Comparison of In-Bound Traffic Movements

<table>
<thead>
<tr>
<th>Period</th>
<th>I-275 SB to I-175 EB(a)</th>
<th>I-275 NB to I-175 EB(a)</th>
<th>1st Ave. WB left-turn @ 16th St.</th>
<th>5th Ave. EB left-turn @ 8th Street</th>
<th>8th St. NB left-turn @ 1st Ave.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Before”</td>
<td>280</td>
<td>147</td>
<td>33</td>
<td>916</td>
<td>249</td>
</tr>
<tr>
<td>“After”</td>
<td>404</td>
<td>189</td>
<td>22</td>
<td>859</td>
<td>454</td>
</tr>
</tbody>
</table>

(a) Highest 15-minute volume over entire period of data collection prior to game time.
(b) Highest 5-minute volume over entire period of data collection prior to game time.
(c) Highest hourly volume over entire period of data collection prior to game time.

Fan Perception Survey

A Tampa Bay Devil Ray fan perception survey was conducted on Sunday, June 24, 2001. This particular day was selected for fan survey since it was anticipated to be one of the largest crowds of the year. Attendance for this game was the second largest of the year (27,999), but still only represents 63 percent of full stadium capacity. Furthermore, according to the St. Petersburg Police Department experience, the attendance threshold for experiencing traffic and parking congestion at Devil Ray events begins at 25,000.

The survey consisted of five questions that were asked of the fans as they were entering the ballpark. Three of the five questions related to parking and the electronic roadside message signs, and the other two marketing related questions were asked strictly on behalf of the Devil Ray organization (having no relevance to the project performance evaluation). The survey was conducted at the major entry gates to Tropicana Field, between 10am and 1:15pm (just prior to game time). A total of 332 (1.2 percent) of the entering fans were randomly surveyed.

The perception at least among some project advocates was that efficiently finding parking was a problem for fans coming to a game. The deployment of the I-275 DMSS is viewed as a remedy to this problem. Therefore, in the brief time available for a fan survey as they are walking up to the ballpark, it was imperative to attempt to validate this perception.

The first question asked was, "Did you experience (or have you ever experienced) delay in finding parking for a Rays game?" Almost 90 percent responded "no".
The second question asked was, "Did you notice the new electronic roadside message signs as you were approaching Tropicana Field?" (with a site map and sign photo provided for quick visual reference). Almost 70 percent responded "yes".

For the third question asked, "Was the parking information on the sign useful to you?", just over half of the respondents (54.5 percent) said "yes", almost one-third said "no", and the remaining 13 percent had no response.

**Project Partner Interviews**

The local project partners were interviewed twice, before (May 17, 2001) and after (August 16, 2001) the project "burn-in" period. Project partners included the City of St. Petersburg Police Department (special events and communications center), City of St. Petersburg Transportation and Parking Services Department (traffic signal maintenance and engineering), and the FDOT District ITS Engineer and Construction Project Manager. Interviews were conducted to assess agency project expectations, general level of satisfaction, and identify any technical, institutional, or legal issues that may have arisen and how they were resolved.

The May 17th interview was conducted as a one-hour collective group discussion. All viewed the project as successful, however, the following discussion points were brought out:

- The Police Department indicated DMSS software training had been difficult to schedule for all of their communication center personnel that needed to receive it. Only about one-third of the communications personnel could be scheduled for training directly by the vendor, the others eventually learned from those that had been trained. Since the vendor provided only one, half-day training session (limitation of contract), it was suggested that in future similar ITS contracts more extensive training for local operators should be provided.

- The Transportation and Parking Services Department indicated that the single biggest problem encountered during project deployment was the DMSS communications line routing (this will be discussed in the second interview recap).

- The Transportation and Parking Services Department also indicated that they believed the too much time was extended for the project's design-build approach. This was the FDOT District's first attempt using this type of contract approach for an ITS project, creating the need for a new process for specification development. Also, only one qualified bid was received. The key lessons learned were to "fully identify and understand the full scope necessary for design-build", and "require a customized timetable to be developed for future design-build contracts".

- The general understanding for the initial intent of the project is that it will be used to assist traffic arriving to Tropicana Field for Devil Ray baseball games. However, the City now desires the DMSS to be used for other downtown St. Petersburg events other than baseball games. They felt strongly that the DMSS should not necessarily always be blank when there is no baseball.
The August 16th interview was conducted as a one-on-one email survey with each project partner. This interview included the following ten questions, and responses have been summarized after each question.

1. Have all your original objectives and expectations for this project been met? If not, please detail your unfulfilled expectations or objectives.

The City Police Department indicated that their objectives have been met. The City Transportation and Parking Services Department indicated that since they were not directly involved in the design phase of the project they did not know if original objectives were met, however, their primary responsibility and concern (on-going system maintenance) has been successfully contracted. The City Transportation and Parking Services Department would have also preferred some additional flexibility on use of messaging (public service announcements and pre-event information).

The FDOT believed that the objectives in the partnership agreement that were achievable within the constraints of this particular project development and funding have been met, and future integration of this initial project into the planned network for regional freeway management will allow the longer-term partnership objectives to be achieved. The FDOT also indicated that regularly scheduled meetings to review design plan progress and to address design issues helped the contractor develop a good set of plans. Additionally, on future projects it would be beneficial to avoid third party service providers for the communications link.

2. Over the course of project development, deployment, and current operation, what technical issues arose, and have they been satisfactorily resolved? If yes, how? If no, why not?

According to all, the major technical issue that arose was the result of third party involvement. Essentially, leased lines from a service provider (Verizon) were used to transfer data between the three signs and the primary control center. These ISDN lines were initially routed to Tampa, then back to St. Petersburg. This created communication routing and capacity problems, which were resolved to a certain extent by providing Verizon with all the necessary communication bandwidth requirements. Lesson to be learned is that an owner-operated communication link (fiber-optic whenever video is involved) should be used. The communication link between the primary control center and the secondary control center utilizes the City-owned fiber optic system, and very little communication problems have resulted.

Most recently, the City discovered that the use of Windows NT and its partitioning criteria has limited the operational capabilities (i.e., memory fills up quickly and locks up computer which requires re-booting of the entire system). Also, downloading by phone lines still takes two minutes or more to complete. The FDOT Construction Manager believed this problem may be due to the small partition size of the C-drive, and suggested that the City obtain a copy of "Partition Magic" and resize the C-drive. There should be enough hard drive space on the D-drive such that the C-drive size can be increased without affecting the data on the D-drive.
3. Over the course of project development, deployment, and current operation, what institutional/governmental issues arose, and have they been satisfactorily resolved? If yes, how? If not, why not?

The only institutional issue that arose was defining the inter-governmental agreement and source of additional funding for maintenance once construction was complete. The FDOT was very cooperative with the City in this matter by providing the remaining funds in the construction contract (approximately $105,000) to the City of St. Petersburg to establish a maintenance contract for the system. Additionally, the operating and maintenance agreement itself transferring responsibility to the City was very unique (e.g., limitations on how the system was generally to be used, determining timeframe for future transfer of operation and maintenance responsibility back to FDOT, letting the City operate and maintain something in the Interstate right-of-way, etc.). This agreement had to be resolved between the FDOT and City two years before actual operation of the DMSS, however, because this was such a unique and perplexing issue the FDOT believes that having a written agreement in place in advance was the best decision to make.

4. Over the course of project development, deployment, and current operation, what legal issues arose, and have they been satisfactorily resolved? If yes, how? If not, why?

There was an initial concern from the City Police Department regarding the need and responsibility for monitoring the cameras on a 24-hour, seven day a week basis. Also, in the occurrence of an adjacent traffic incident not resulting during the same time as a baseball game (or time when the signs were not activated), it was not clear if the cameras and signs were to be automatically activated and utilized in some manner. This concern was resolved when FDOT directed, for purposes of the inter-governmental operations and maintenance agreement, that the system need not be used for monitoring at all times. However, FDOT also acknowledges that the requirements for the timely posting of messages for this initial DMSS will never be fully resolved until such time as the regional DMSS is fully implemented.

The FDOT also pointed out that during the scoping and project development phase of the project, right-of-way certification issues arose. Before the project was let and designed, right-of-way had to be certified (as per requirements of design-build contracts). Since communication lines originally had to traverse County/City/Railroad rights-of-way, this created a problem in obtaining right-of-way certification over an area that FDOT has no control. By terminating communication lines at FDOT right-of-way, then continuing to the City's control center over leased lines (Verizon), this potential legal problem was remedied.

5. What, if anything, would you choose to do differently if you could do it again? (i.e., with the experience gained from this project, what advice would you give to others attempting to develop, deploy, and operate a similar system?)
The common response to this question was to not use leased lines for communication, install your own. It was also found that fiber-optic links are preferred for communication bandwidth required for video and data, however, on a limited project budget it can also be difficult to find available and suitable City right-of-way for fiber-optic installation. Therefore, construction of the communications trunk line and service should be included as a separate item in the overall contract budget, and communication equipment requirements must be specified.

Because of the complexities of this first time project deployment and contract/partnership approach undertaken by the project partners, implementation took longer than expected. In order to accommodate changes in participating agency personnel during a longer than expected project development and deployment period, a detailed implementation timetable would be helpful for all project partners.

6. In your opinion, has the system performance and project partnership been a success? If yes, why? If not, why not?

Once initial communication reliability was achieved, most all responded that the project performance and partnership has been a success. However, the FDOT Construction Manager believed that project performance could still be improved. It has been observed (after design was approved and the project was near the end of construction) that a communication system change could be made at minimal cost to provide greater bandwidth capacity, and provide for faster response and control of cameras and signs by avoiding an unnecessary layer of third party communication software. It was hoped that the City might still choose to make this change.

7. What tangible, measurable benefits (if any) can be produced that clearly show evidence of improved operating conditions, increased safety, or cost reduction since DMSS was implemented?

The City Police Department believes that the sign messages have made a difference in traffic flow and in calming tempers. Having the DMSS on the Interstate has allowed the City to better use its resources (portable message signs) to manage baseball and other special event traffic. Additionally, changing the Interstate DMSS as conditions vary is much easier and quicker than changing the portable message signs. Coincidently, the City Police Department believes the interstate DMSS should be turned off when there are no events occurring. Also, according to the City Police Department, the interstate DMSS have only been used for events to date (they have not been activated during non-event traffic incidents).

8. In your opinion, besides Tropicana Field baseball events, what other events have (or in the future could be) benefited from application of the DMSS?

As indicated previously, the Interstate DMSS was used for the "Taste of Pinellas" in June. The City also expects to use the signs for other downtown events (e.g., Rib Fest-November 10-12, concerts at downtown parks, St. Petersburg, etc.)
Anthony's Triathlon weekend-April 28-29, First Night/New Year's Celebration-December 31, and Breast Cancer Walk) later this year. The FDOT expects to utilize the interstate DMSS for real-time incident management in the future as the regional freeway management system is expanded, or even now for planned incidents (e.g., nighttime road construction/repair of closed lanes or ramps)

9. What different messages/message sets, if any, were used for the non-baseball events? If different messages were used, how effective or beneficial were they?

The sign messages have been used and will continue to be used to direct drivers to shuttle parking locations for downtown events. In addition to the messages that have already been developed, new messages will continue to be developed between the City and FDOT as the need arises, instead of storing messages that are never used.

10. Are there any other comments you would like to make, or previous comments you would like to reiterate?

The project was successful because of the working relationships that developed among FDOT, the City, the contractor, and Verizon. It was suggested by the City that a new job position be added to their staff to maintain the DMSS when the O&M contract expires.

The FDOT indicated that this project was one of the first in Florida to use federal funds for real-time operations and preventative maintenance, demonstrating the growing realization that operation/management in real-time (not just passive maintenance) is important to a successful transportation project.

The debate over the appropriateness of blank signs versus continuous, but pertinent, messaging will continue. Further research and/or awareness regarding this issue are desirable.

Other Project Evaluation Issues

Feasibility Determination for I-275 DMSS

During November 1998, HDR Engineering and PB Farradyne Inc. were retained by FDOT to conduct a feasibility study for the installation of the I-275 DMSS. A major facet of this study involved conducting telephone interviews of local transportation agencies to devise a "concept of operation". The results of these interviews lead to the current contractual arrangement for operation and maintenance previously discussed.

Specifically, for special events, FDOT would review City's plans. For incident management, FDOT would develop plans and assist in operation. The City will continue to manage, operate, and maintain as long as the DMSS supports only special City events. When project is incorporated into planned future regional incident/freeway management system, then FDOT will take over this responsibility (except during actual times of special City events).
Active partnerships established at this time for the I-275 DMSS between FDOT and the local agencies will form the basis of the regional concept of operation for freeway traffic control and incident management.

**Design-Build-Maintain Method of Procurement**

The design-build-maintain method of procurement was selected for this project deployment. This was the first time for FDOT District 7 office that this method of procurement was used. This method was selected to shorten the time to get the contract underway without going through a separate process of detailed plan development by FDOT, and allow the use of project funds to pay for contract maintenance for a specified period of time. Deliberate and informed expediency was the key to initiating, designing, and building a successful ITS system, according to the July 2001 Traffic Control Devices (TCD), Inc. Final Report on the project.

Design-Build-Maintain contracts also offer the full transfer of responsibility to the design build team, eliminates imperfect transfer of design knowledge from designer to contractor, and the engineering and construction work is done cooperatively with a single entity to resolve problems. As mentioned previously, right-of-way certification issues for communication lines not falling in FDOT property did create some delays, and the City was not directly involved in the design activities at the project’s outset somewhat minimizing further advantages in design and/or installation troubleshooting.

**NTCIP Compliance**

In August-September 2000, at the request of the FDOT District 7 office, the FDOT Traffic Engineering Research Lab (TERL) at FAMU-FSU College of Engineering in Tallahassee conducted a Level 1 (mandatory objects only) National Transportation Communications for ITS Protocol (NTCIP) Compliance Evaluation for the Vultron Dynamic Message Sign (DMS) Controller.

This test checks to make sure that the read-write objects can be set to specific, valid values and to make sure the read-write objects provide the appropriate information when requested. In total, 43 objects (34 read-only and 9 read-write) were checked. The controller was set to “local” so that the messages to be displayed could be viewed.

With the exception of one minor error found with the dmsMessageMemory Type, all other objects appeared to respond properly to the requests given, according to the October 9, 2000 TERL evaluation report. This error was characterized as minor because the series of requests leading to this error are unlikely to occur. Vultron, Inc. was contacted by the TERL about the error, acknowledged it was an error, and corrected the problem.

**Operations and Maintenance Agreement**

As mentioned previously, responsibility for operations and maintenance of the I-275 DMSS was directed to the City, setting a precedent (at least in Florida) for local government responsibility within Interstate right-of-way. By resolution adopted on April 22, 1999, the mayor for the City of St. Petersburg was authorized to execute this
agreement with FDOT. The agreement was formally executed on June 7, 1999. Terms of this agreement are not to exceed a period of ten years.

The DMSS remains the property of the FDOT, and the City is not to remove any of the equipment without prior consent of the FDOT. Basically, the City agrees to keep the DMSS fully functional, provide the necessary training to its employees (or contractor) prior to the beginning of operations, and agrees to establish and maintain a primary and secondary control center for DMSS operations providing right of entry to FDOT.

An Invitation for Bids was issued on January 22, 2001 by the City of St. Petersburg for a "Multi-Year Contract for DMSS Management and Repair." The intent of the bid is to outline the non-warranty management and repair services necessary to keep the I-275 DMSS completely functional and operational. The required services include monthly routine preventative maintenance (12 months), service calls (10, no more than 3 hours each) for diagnosing repairs, hourly rate for repairs (100 hours), and telephone system support (100 hours). This contract is effective from date of award through January 31, 2003, and the City reserves the right to extend the contract under the same terms and conditions for up to two, one-year periods upon agreement of both the City and contractor. Parts are to be invoiced at cost plus 10 percent. Further, the City must be notified prior to any repairs if parts and labor will be equal to or more than 50 percent of the replacement cost of the original equipment.

Through an amendment to the Operations and Maintenance Agreement, FDOT provided the City with $105,000 (deployment grant surplus) for operations and management. The current year City budget allocated for annual preventative maintenance is $80,000 ($70,000 for maintenance, $10,000 for operations (telephone and electrical costs)). The contractor selected submitted a bid of $69,438.66. As of early October 2001, the City has paid three monthly billings at $4,700 each. No warranty work has been required to date. Most importantly, it is not known how and what amount the City will budget for annual operations and maintenance once the initial $105,000 from FDOT is expended.
**Dynamic Messaging System**

Working with the City of St. Petersburg, the FDOT established four stages of standard DMSS messages. These stages are described in the following table.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Threshold Conditions</th>
<th>Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Game attendance less than 20,000</td>
<td>For northbound DMS, “Rays Baseball Parking Use Exit 10” For southbound DMS, “Rays Baseball Parking Use Exit 9” For eastbound DMS, “Rays Baseball Parking This Exit”</td>
</tr>
<tr>
<td>2</td>
<td>Game attendance between 20,000-25,000 And Cash lots are 80% of capacity, or more than 50% of available cash lots are full</td>
<td>All portable VMS units indicate, “Tropicana Field Cash Lots Full”, and For northbound DMS, “Rays Baseball Cash Parking Lots Full, Alt. Parking-Take Exit 7” For southbound DMS, “Rays Baseball Cash Parking Lots Full, Use Exit 10 to Alt. Park” or “Rays Baseball Alt. Parking Exit 10 Use Pier &amp; Baywalk”</td>
</tr>
<tr>
<td>3</td>
<td>Game attendance greater than 25,000 And Cash lots at 80% of capacity or more than 50% of available cash lots are full</td>
<td>Same as Stage 2, except when alternate parking sites are full For southbound DMS change to, “Rays Baseball Cash Parking Lots Full, Alt. Park Take Exit 12” For eastbound DMS change to, “Rays Baseball Cash Parking Lots Full, Straight Ahead Alt. Parking at 4th St”</td>
</tr>
<tr>
<td>4</td>
<td>Accident or other significant traffic problem</td>
<td>Determine where problem exists and change messages to alert drivers in advance of problem area. Northbound DMS to encourage drivers to exit at 31st Street, and southbound DMS to encourage drivers to exit at 22nd Avenue North</td>
</tr>
</tbody>
</table>

Note: Messages begin running 3 hours prior to start of game, and stop running 30 minutes after game starts.

Real-time parking lot conditions dictate which stage of sign messages are activated. To date, as mentioned previously, the DMSS has been used only for events (i.e., Stage 4 has not been activated). There was some debate between the City and FDOT as to how far in advance of game time the DMSS should be activated. Keeping to an even hour or half hour time to start operation, it was decided by FDOT to activate the DMSS at 4:30pm for a 7:15pm game and 10am for a 1:15 game.

There was also an inquiry by the Devil Rays if the southbound DMS could be changed to instruct drivers to take exits 9 and 11 for parking, not just exit 9. It was pointed out by FDOT that providing ambiguous information to the drivers for two exits in the same message is not good practice, and does not provide clear directions to the motorist. It was recommended that when the Exit 9 ramp is backed up, then change the DMS message to Exit 12, or develop new message to use Exit 11. Exit 9 is the primary exit because it has more direct access to the larger parking areas, plus easier to re-direct traffic around Tropicana Field to 16th Street from Exit 9. Exit 11 provides the most direct access to parking on the west side of Tropicana Field. The decision to change to Exit 11 (or Exit 12) on the southbound DMS is to be based upon real time evaluation by the St. Petersburg Police Department.
Usage of DMSS for Non-Baseball Events

The primary use of the DMSS is for Tropicana Field. In addition to being home of the Tampa Bay Devil Rays Major League Baseball organization, other special events are also held at Tropicana Field (e.g., trade shows, concerts, conventions). Baseball season runs from approximately April 1 to October 1 each year, and this is when the DMSS would have the most usage. However, the DMSS may also be utilized to display traffic warnings, parking instructions, and directions due to accidents. To date, the DMSS has only been used for events (not incident management).

As a result of the May 17 group interview discussion with project partners, the FDOT agreed to activate the DMSS for an upcoming downtown St. Petersburg event (Taste of Pinellas-June 1, 2, and 3) in order to provide improved real-time parking directions and management. Devil Ray baseball did not conflict with this event. FDOT further stipulated that time of usage for this event should be restricted to when the event is actually occurring (not for advance notice of a coming event), and messages should be consistent and relate to venue (e.g., “Taste of Pinellas – Parking”). Specifically, the City Police Department’s plan for the DMSS is to direct event patrons from the Interstate to a specific exit. From this point of exit, portable message boards will then direct event patrons to specific remote parking areas offering shuttle bus service to the event.

Summary of Project Evaluation Findings

Based on the fan perception survey, partner survey, and traffic condition survey, at least some anecdotal evidence of addressing four (delay reduction, customer satisfaction, increased throughput (thru more direct access to available parking), and cost reduction (in traffic control)) of the seven standard ITS performance measures linked to the goals of the national ITS Program can be made and is noted in this report. The quantitative evidence, however, is not extensive, overwhelming, and definitive. Safety (reduction in number of fatalities and severity and number of crashes) and environmental (reduction in fuel use and emissions) related performance measures cannot be addressed at this time, and are more long-term benefits of the future regional system.

This ITS deployment project is the first such project, and the first to deploy via a design-build procurement, in the Tampa Bay area. This project also represents the very initial stages of a regionalized, integrated freeway and incident management system, and thus cannot in itself be fully evaluated for its contribution to making transportation facilities more efficient in the St. Petersburg area (Partnership Goal 1). Benefits to motorists during non-baseball events and during traffic incidents have not been determined (in fact the DMSS has not been used for incidents to date). Further, attendance at baseball games has not yet reached levels that necessitate fully engaged dynamic real-time decision-making and dynamic messaging due to severe traffic congestion. However, response from local law enforcement and transportation departments, and baseball fans indicate that the I-275 DMSS is useful for getting clear direction to available parking and the perception is that traffic control and management has been improved.

Following the guidelines of the ITS Strategic Plan and ITS Architecture for District 7, this deployment project has been designed to facilitate later integration with other Tampa Bay ITS infrastructure to provide a cost effective operational solution to the transportation challenges on I-275 (Partnership Goal 3). Freeway and Incident Management is the first priority for ITS deployment in District 7, and the project
architecture (center-to-center communication) is compatible and expandable to meet this priority. However, the primary communication medium and roadside devices of the future (fiber-optics and sensors/DMSs) are not now in place to demonstrate how the priority would be met. The three DMSs and CCTVs deployed via this project will remain in place as part of the future regional system, and the two control centers will remain autonomous, but will be integrated into the eventual Tampa Bay SunGuide Freeway Management System.

Although relatively small in scale, this deployment project has begun to integrate Interstate ITS operations within the Tampa Bay region (Partnership Goal 2). A very unique partnership agreement has been established between FDOT and the City of St. Petersburg to set the basic terms of joint operation and management (until the future regional freeway and incident management system is in place). The governmental partnership sets an example and establishes the general expectations for what will be needed in the future regarding key issues of ITS procurement, deployment, operations, and integrated management. This accomplishment may be the most significant measure of project success.